

# Gesture-based Interface Reconfiguration

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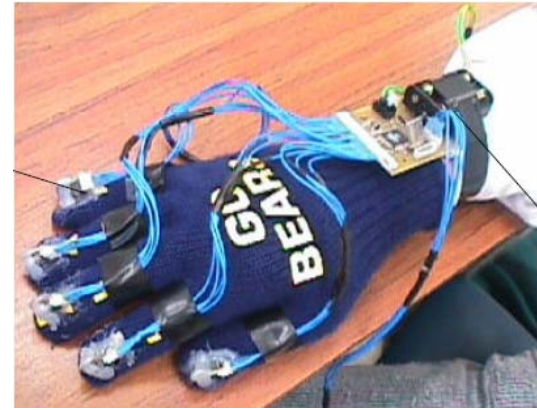
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# Current Computer Interfaces



- Hard to use and learn
- Fixed control functionality
- Hard to access

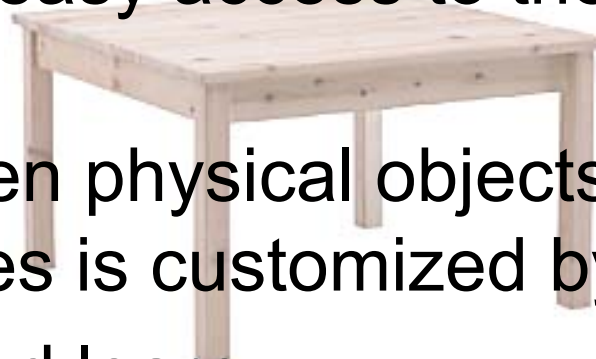


→ Mapping between objects and gestures in the physical world and the controlled entities and action of the application

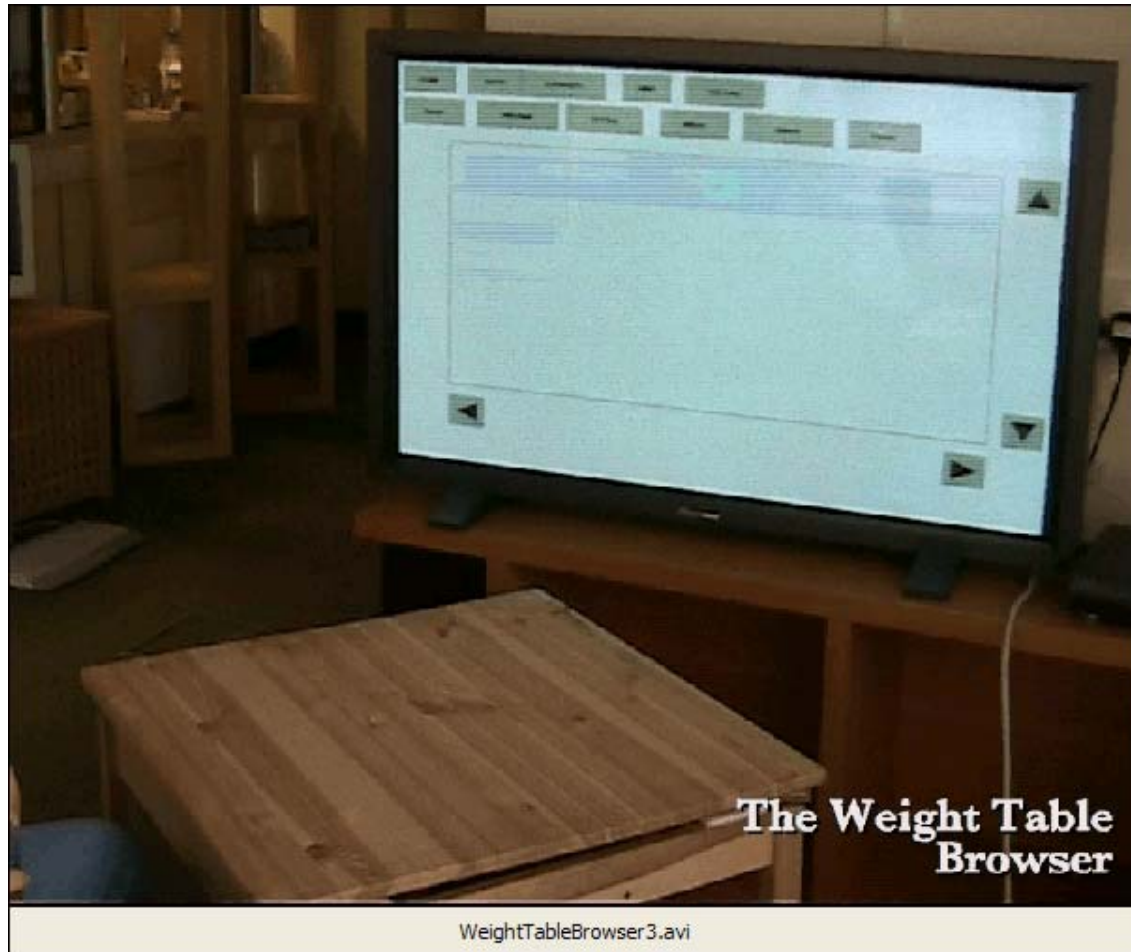
# Everyday artefacts as TUIs



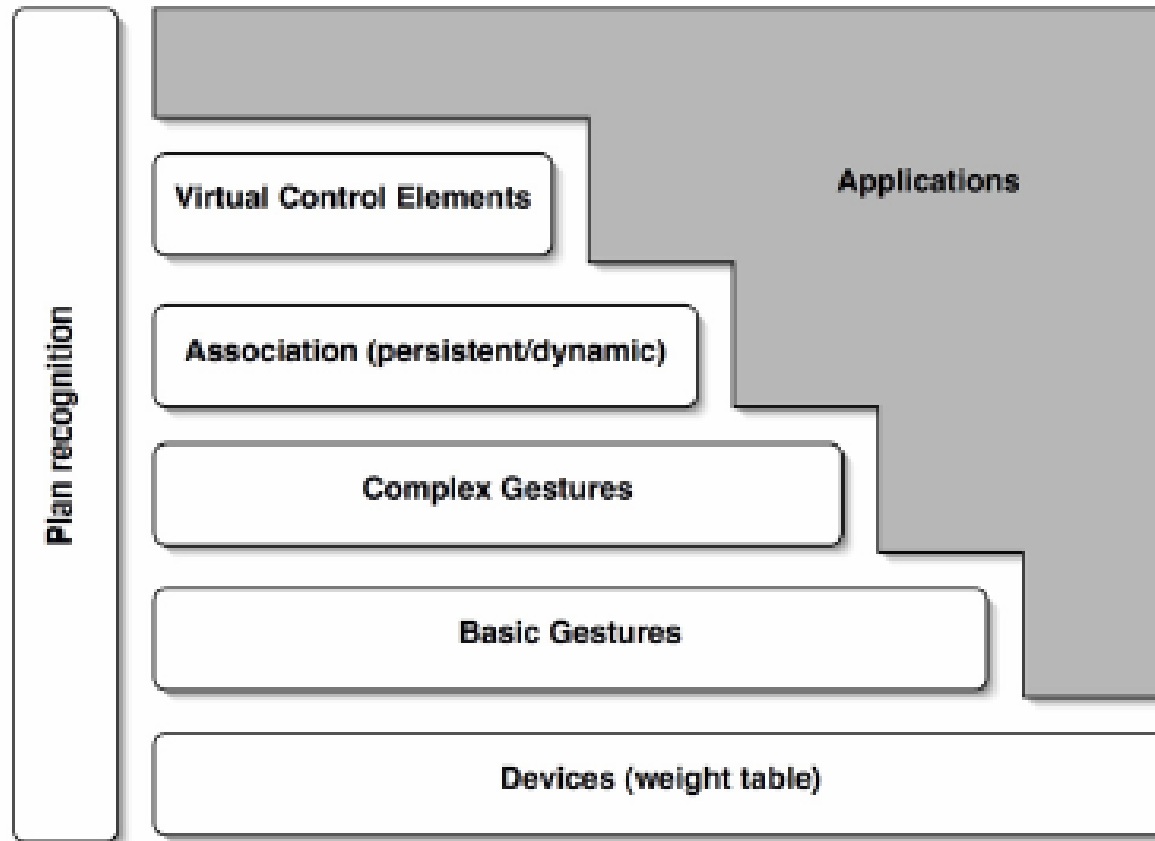
- Augment a single object – Weight Table
- Use arbitrary mobile objects
- Ubiquitous and easy access to the physical interfaces
- Mapping between physical objects and controlled entities is customized by the user
- Easier to use and learn
- More flexible control functionality



# The Weight Table Browser



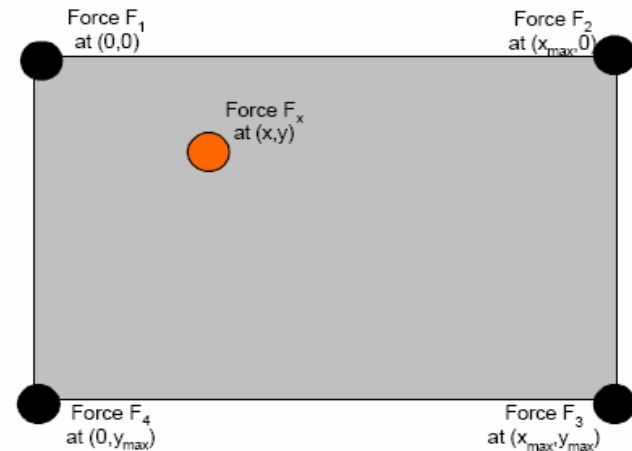
# Architecture Overview



# The Weight Table



- Technology: industrial load cells interfaced by a Smart-its
- Recognizes position of placed and removed objects
- Tracks object on surfaces
- Used for context recognition and as pointing interface



# Gesture (recognition)



- Alphabet of simple gestures
  - Based on what the table can recognize
- Words of complex gestures

Event(EventData)	Gesture Description
PUT_DOWN(x,y,w)	User puts an object on the table.
PICK_UP(x,y,w)	User removes an object from the table.
PRESS(x,y,p)	User increases the pressure on the table.
RELEASE(x,y,p)	User decreases the pressure on the table.

Event(Data)	Uses	Gesture Description
TRACE_START(t rajectory,p)	PRESS	User starts moving (an object) across the table.
TRACE_STOP().	RELEASE	User stops moving (an object) across the table

# Control Associations



- Virtual Control Elements (e.g GUI Widgets) are assigned to Objects on the Table based on their location

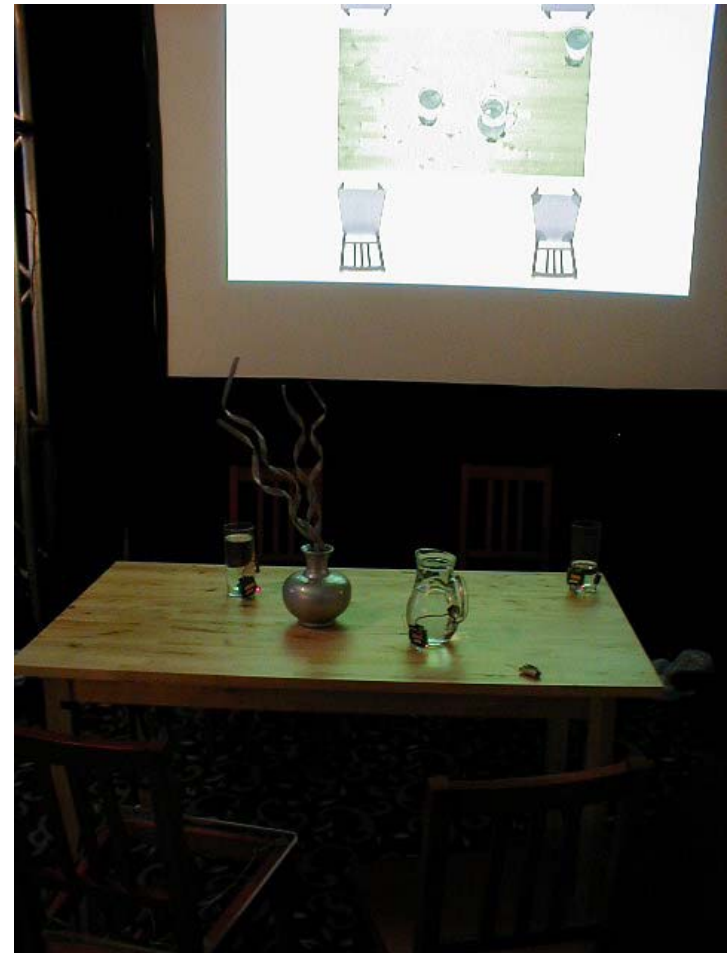


- Complex gestures
  - ASSOCIATE: PUT-DOWN, NO-EVENT(long);
  - DISASSOCIATE: PICK-UP, NO-EVENT(long)
  - RECONFIGURE: PICK-UP, NO-EVENT(short), PUT-DOWN

# Persistent associations



- Persistent association
- Smart Objects
  - Collaborate with table
  - Store persistent associations
- Instant reconfiguration
- Supports mobility across different environments
- Proof of concept at SIGGRAPH Emerging Technologies Exhibition



# Accidental Usage



- No problem for associated objects
- Feedback
- Gestures for configuration and control mode
- Gestures confirming each associations
- Plan recognition



# Knowledge-based reasoning



- Taking knowledge of control functionality into account
  - A control does not support a TRACE\_EVENT
- Plan recognition
  - Predict future actions
  - Disambiguation of objects and controls
  - Avoids accidental associations
- Potential to improve recognition

# Conclusions



- Tangible interface
  - single augmented object
  - Unmodified everyday objects
- Initial prototype
  - Identified the challenges
  - Directions for future work

# Future Work



- Interface accessibility
- Usability
- Flexibility
- Persistent versus dynamic mapping
- Accidental usage
- Improve recognition



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Questions ?

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